Supporting Information

Role of Graphene on Hierarchical Flower-like NiAl Layered Double Hydroxide-Nickel foam-Graphene as Binder-free Electrode for High-rate Hybrid Supercapacitor

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Supporting information Figure S1.

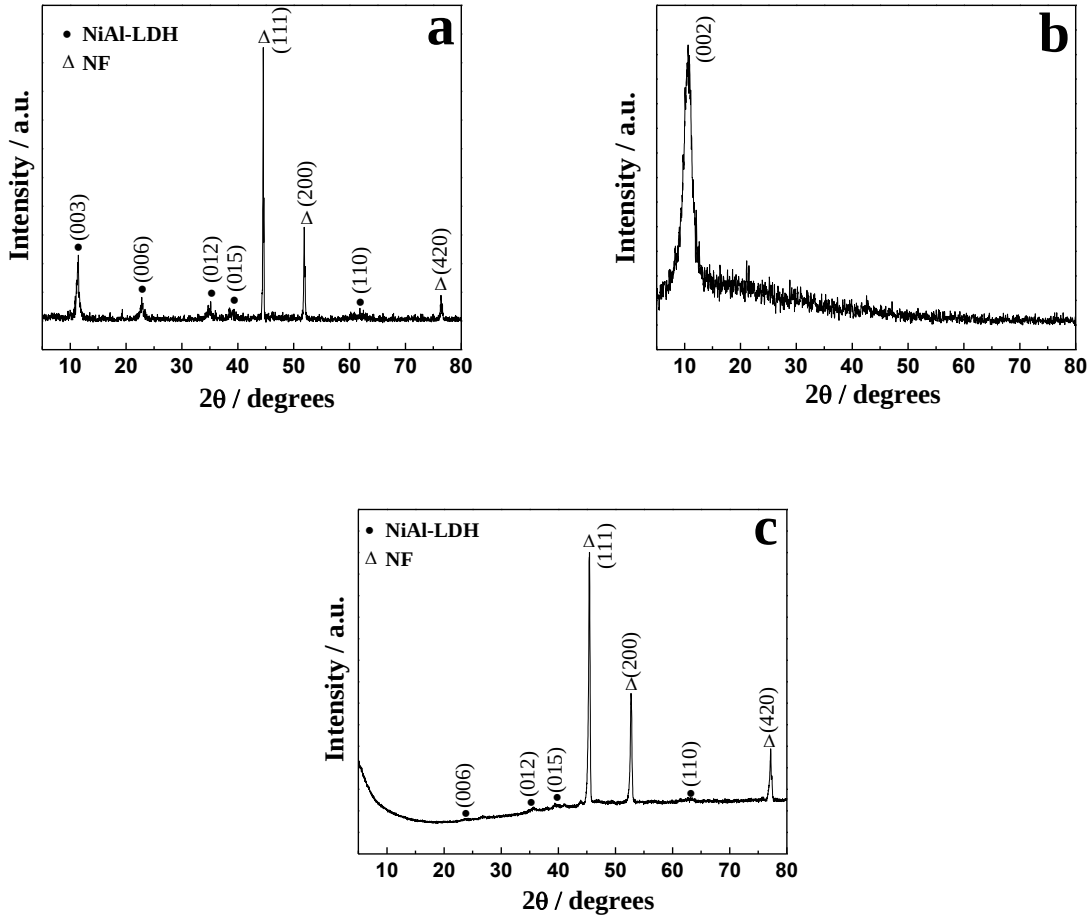

Fig. S1 XRD patterns of LDH-NF (a), GO (b) and LDH-NF/GNS (c)

Supporting information Figure S2.

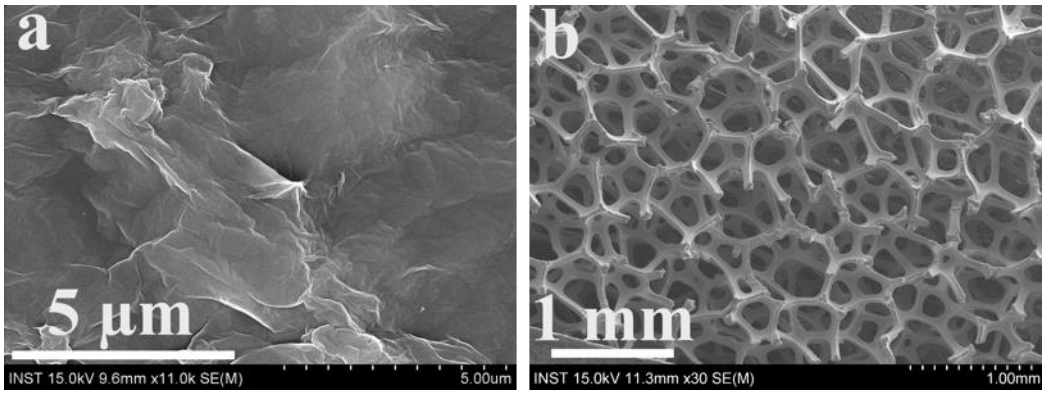

Fig. S2 SEM images of (a) GO and (b) NF

Supporting information Figure S3.

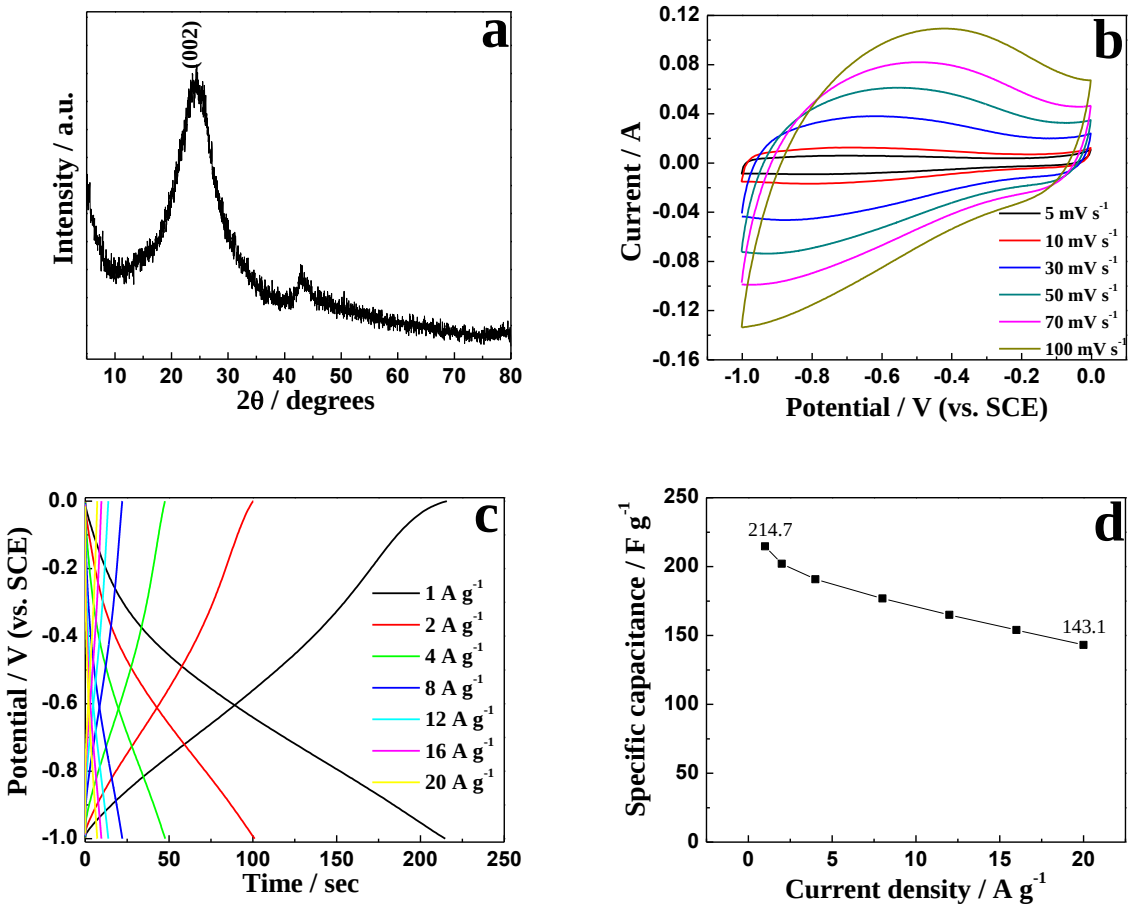

Fig. S3 (a) CV curves of GNS at various scan rates. (b) Charge-discharge curves of GNS at different current densities. (c) Specific capacitance of GNS at different current densities.

Table S1 Comparison of electrochemical performance of the reported NiAl-LDH/carbon materials-based electrodes (C_s: specific capacitance)

Material Samples	C_s (F g^{-1})	Current density (A g^{-1})	Cycle stability	C_s after cycling test (F g^{-1})	Reference electrode	Ref
rGO nanocup/NiAl-LDH	2172.7 1174	1 50	30 A g^{-1}, 5000 cycles, 98.9%	~1500	SCE	1
NiAl-LDH/C	1064 758	2.5 12.5	25 A g^{-1}, 500 cycles, 50.5%	246.3	SCE	2
GNS/NiAl-LDH	781.5	10 mA cm^{-2}	10 mA cm^{-2}, 200 cycles, 122.6%	693.7	SCE	3
NiAl-LDH/CNT/rGO	1869 713.4	0.0625 6.25	0.625 A g^{-1}, 1000 cycles, 96.5%	1200	SCE	4
a-GNS/NiAl-LDH	1730.2 790	0.1 10	5 A g^{-1}, 500 cycles, 99.2%	976.2	SCE	5
NiAl-LDH array/GNS	1329 851	3.57 17.86	15.3 A g^{-1}, 500 cycles, 91%	823	SCE	6
NiCoAl-LDH/C	1188 850	1 10	6 A g^{-1}, 1000 cycles, 100%		SCE	7
NiCoAl-LDH/MWCNT	1035 597	1 10	6 A g^{-1}, 1000 cycles, 83.2%	~700	Hg/HgO	8
NiAl-LDH/NF	795 220	0.5 10	2.5 A g^{-1}, 1000 cycles, 80%		SCE	9
Al doped $Ni(OH)_2$/NF	2122.6 1389.4	1 6	1 A g^{-1}, 500 cycles, 78%	1800	SCE	10
NiAl-LDH/NF	701 164	0.5 5	2.5 A g^{-1}, 400 cycles, 94%	~460	SCE	11
LDH-NF	817.7 C g^{-1} 564.7 C g^{-1} 415.4 C g^{-1}	2 20 40	40 A g^{-1}, 4000 cycles, 45.9%	150.3 C g^{-1}	SCE	this work
LDH-NF/GNS	645.6 C g^{-1} 357.7 C g^{-1} 209.8 C g^{-1}	2 20 40	40 A g^{-1}, 4000 cycles, 54.1%	165.6 C g^{-1}	SCE	this work

Table S2 Comparison of the maximum energy density and the corresponding power density and voltage range of the reported nickel or cobalt oxide/hydroxide based hybrid supercapacitors

Positive materials//negative materials	Energy density (Wh kg^{-1})	Power density (kW kg^{-1})	Voltage range (V)	Ref
NiO//C	13	0.04	0-1.5	12
Co3O4//AC	24.9	0.225	0-1.5	13
NiCoOx-GNS//AC	7.6	5.6	0-1.4	14
NiCo2O4-rGO//AC	23.3	0.32	0-1.3	15
NiCoOx//AC	12	0.095	0-1.2	16
NiCo2O4//AC	15.42	~0.8	0-1.5	17
Ni-Zn-Co oxide/hydroxide//C	16.6	2.9	0-1.5	18
Ni(OH)2//GNS	30	1	0-1.6	19
Ni(OH)2//ZnFe2O4	14	0.209	0-1.6	20
Ni(OH)2@3D Ni//AC	21.8	0.66	0-1.3	21
NiCo LDH-Zn2SnO4//AC	23.7	0.28	0-1.2	22
NiO-NF//AC	19	0.12	0.8-1.5	23
NiCo2O4@MnO2-NF//AC	~28	0.4	0-1.5	24
Co(OH)2-NF//GO	11.9	2.54	0-1.2	25
Ni(OH)2-NF//AC	10.5	0.687	0-1.6	26
Ni(OH)2/GNS/NF//AC	11.11		0.2-1.6	27
NiCoOx-NF//AC	22.66	2.13	0-1.5	28
NiO-NF//MWCNT	27.8	0.7	0-1.4	29
LDH-NF/GNS//GNS-NF	31.5 19.7 12	0.4 3.2 8	0-1.6	This work

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